

**Scientists & Farmers Are Revolutionizing Tropical Hillside Agriculture Goals
Are to Raise Incomes, Prevent Ecological Disasters**

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The world's tropical hillsides, on which 525 million people live and farm, are annually losing nearly 10,000 square miles of tropical forests to deforestation and 13 billion tons of topsoil to erosion according to scientists at the Consultative Group on International Agriculture Research ([CGIAR](#)).

This is an extremely important and diverse ecosystem. Tropical hillsides in Latin America, Africa and Asia cover 5 million square miles (13 million square kilometers), or 9 percent of the Earth's landmass. Tropical hillsides contain 50 percent of the world's tropical forests and 20 percent of the world's fresh water. Africa holds 40 percent of the earth's tropical hillsides, while Asia and Latin America each contain some 30 percent.

The consequences of this environmental degradation on tropical hillsides are visible on TV news nightly, from the mudslides that hit rural Mexico this October, to the devastation that Hurricane Mitch brought to Central America in 1998, killing 12,000 people.

CGIAR scientists and farmers are now revolutionizing tropical hillside agriculture in order both to increase income for farmers and to halt this massive hillside erosion and deforestation.

"We need a way to bring together and distribute the knowledge that these isolated farmers have gathered over hundreds of years and combine that with the latest agricultural technology for hillsides," says Ismail Serageldin, CGIAR chairman, as well as World Bank Vice President for Special Programs. "That's why communications are key to any successful development effort. We want to end the isolation of these farmers and their families and assist them to enter the global economy of the 21st century."

About 40 percent of the inhabitants of tropical hillside regions live in absolute poverty. This poverty has caused widespread suffering and hunger, and has led to political and criminal violence and growing criminal activity - especially drug trafficking in South America, Mexico and Southeast Asia, and the civil war in Rwanda.

"The conditions of tropical hillside poverty and violence are also causing a mass exodus of the poor to cities around the world, increasing urban congestion, crime and disease," says Jacqueline Ashby, Ph.D., research director at the International Center for Tropical Agriculture (CIAT, for its initials in Spanish) and chief author of a new report: *Farmers' Knowledge Meets Formal Science: A PeopleCentered Strategy For Combating Poverty and Environmental Destruction in Tropical Hillsides*.

CIAT, based in Cali, Colombia, is one of CGIAR's 16 research centers around the world and part of Future Harvest.

Hurricane Mitch wiped out 70 percent of the crops in Honduras and Nicaragua, killed some 12,000 people, and left three million people homeless. Much of this destruction derived from the erosion prevalent across much of Central America, the result of hundreds of years of hillside agriculture. The soil, largely bereft of the trees and native plants that once protected it, could not absorb the huge amounts of rainfall from the hurricane. A similar situation took place in Mexico this October, when mudslides brought on by heavy rain killed between 300 and 600 people.

"Hurricane Mitch provided Central America and the rest of the world with an unforgettable lesson in the interdependence of town and country," the CIAT report says. "Suddenly, urban and rural people found themselves in the same boat -- city dwellers who lost their homes and livelihoods together with small farmers whose land and crops were washed away. Few could ignore the prospect of food shortages and other deprivations in the coming months. And all were left wondering: can something be done to make the region and its people less vulnerable to such disasters in the future?"

CGIAR scientists were already working on the problem. CIAT launched a new program in 1993 to bring the latest scientific advances to bear on this neglected environment. The Center's collaborative work with farmers, non-government organizations (NGOs) and national institutions has resulted in a novel program of "integrated research with a landscape perspective," which is being tested at three hillside sites in tropical Latin America.

Under this approach, local researchers and development specialists work with rural communities to carry out the following five steps:

1. Devise powerful, computer-based, geographic information systems (GIS) that simplify the tasks of monitoring agricultural land use and choosing alternative courses of action at the regional, national, and local levels.
2. Train poor farmers to develop and test solutions to problems in agriculture and to disseminate them in rural communities, with only modest assistance from the outside.
3. Design and create grassroots organizations that can orchestrate collective efforts (involving rural communities and the institutions that serve them) to combat poverty and improve the management of natural resources in hillside watersheds.
4. Establish networks of local experimental sites, where scientists, farmers, and development specialists can work jointly to develop and evaluate a wide range of alternative technologies for agricultural production and natural resource conservation.
5. Develop simple but reliable tools that enable local communities and institutions to collect and manage the information they need for making decisions and planning initiatives that promote local development and environmental conservation.

The Program in Action

CIAT scientists are forming local agricultural research committees and community watershed associations to work with farmers and local specialists in several countries of Latin America. These grassroots organizations serve as a catalyst, providing farmers with advice and credit, and often improved seed.

Pedro Herrera, who farms land on a hillside in the upper reaches of the Cabuyal watershed in Colombia, is an example of a farmer who has benefited from the new program. "For all the questions I used to have about farming, I had to supply my own answers," he recalls. "Now I have technical assistance."

"My cattle used to drink at the springs and stir up the water," says Herrera. "Sometimes they would even get stuck in the mud." Then, following advice from the watershed management association, he fenced off the springs to keep the cattle out and planted trees. The buffer zones, which promote both water quality and increased flow, amount to about one hectare (2.47 acres) per spring. These are a big contribution to the community, since water from Herrera's land makes its way to six aqueducts serving downstream households.

In exchange for his cooperation, Herrera received concrete tubs to water his cattle. The coffee growers' association, which is a member of the watershed management association, paid for these concrete tubs. While the fenced-off areas are not cultivated or trodden on by animals, they are still productive. From the woods, Herrera can still harvest a tasty native fruit called lulo.

Among his cultivated crops are beans, maize, coffee, sugarcane, cassava, sweet peas, and -- his pride and joy -- blackberries. His cows give him milk for home consumption and for sale, and in a hillside pond he raises carp, the surplus of which is sold to neighbors. In addition, his wife raises chickens, thanks to a small loan arranged through the committee.

In earlier years Herrera sold his crop harvests at the farm gate to middlemen. But his farm diversification, especially the blackberry operation, has given him enough cash income to buy a truck.

Now he markets his own produce in nearby towns and, to offset his fuel costs, and also transports materials for his neighbors.

Along with advances in crop production, Herrera has also protected his slopes from erosion and taken care not to contaminate soil or water. "Live barriers" of improved grasses hold the soil in place in steep areas and fallen leaves are left as groundcover to slow down rain runoff. To avoid disturbing the soil too much, Herrera does not plow his fields; soil preparation is kept to a minimum. He also uses very little chemical fertilizer and no pesticides at all. Crops are protected mainly through rotation, intercropping, insect-repelling border plants, and weeding with a machete so that roots are left intact.

The Tropical Hillside Regions

Poor farm families on tropical hillsides suffer from low and stagnant incomes, limited opportunities for employment, low agricultural productivity, poor access to education and health services, and a lack of political power and institutional support.

"The plight of hillside communities is also amplified by environmental damage," the report says. About 60 percent of the hillside area in Central America and the Andean Zone shows signs of serious soil erosion. An estimated 13 billion tons of topsoil are lost each year, reducing agricultural productivity and clogging lakes and streams with silt."

Hurricane Mitch was the worst natural disaster to hit Central America in this century, and the agricultural sector of Honduras and Nicaragua took the brunt of it. Experts estimate that the storm destroyed up to 70 percent of the countries' basic food crops, of which beans and maize are most important. Nicaragua lost about 60 percent of its bean crop and 40 percent of its maize crop. In Honduras, 75 percent of the bean crop and about half of the maize crop was lost.

In addition, the storm caused heavy damage to the natural resources that underpin agriculture. In many places Hurricane Mitch caused massive soil erosion, exposing subsoil and rocks and severely damaging the land's productive capacity. Siltation of rivers also jeopardized water supplies for irrigation and energy generation.

Honduras and Nicaragua depend on domestic agriculture not only to feed their people but also to fuel their economies. Agriculture accounts for nearly 30 percent of the gross domestic product in Honduras and more than 25 percent in Nicaragua. The hurricane wiped out about 80 percent of the commercial crops grown in Honduras and Nicaragua for sale abroad. In Honduras alone, Mitch ruined approximately 27 million banana plants, decimating about 90 percent of the industry's productive capacity. The two nations lost 20-30 percent of their coffee crop. Also, rice, cotton, tobacco, sugar cane, sesame seed, pineapples, cantaloupes, honeydew, and other fruits and vegetables were badly damaged.

Unusually heavy rains across Central America in September and October of this year -- on the eve of Mitch's anniversary -- are making matters even worse for farmers in the region.

"Many rural people in the hillsides of tropical America lose hope of building better livelihoods and join the exodus to the region's urban shantytowns," says Dr. Ashby. "Large numbers of rural people also emigrate from hillside regions to North America in the hopes of finding steady employment and a decent income."

The research that led to this approach was started during 1993 in the watershed of the Cabuyal River, which is located in Colombia's southwestern Cauca Department. The work drew upon many years of only partially successful research aimed at improving crop varieties and farming practices for the region. It also built on more recent efforts to develop and introduce methods for farmer participatory research.

By 1995 the integrated approach was sufficiently advanced for further testing and refinement at sites in other countries where CIAT had a long history of collaborative research on staple crops. The Center and its national and local research partners first applied the approach at two more locations in Central America: first in the watershed of the Tascalapa River in Honduras's Yoro Department and more recently in the watershed of the Calico River in Nicaragua's Matagalpa Department. Partners replicated the approach in three more locations and with CIAT, trained over 1000 professionals from over 400 municipal government, NGO and community organizations. These institutions are introducing elements of the approach into their own programs in watersheds and municipalities elsewhere in Central America as a result of action plans formulated during the training, for which they are seeking funding from national ministries and international development agencies.

"The approach is now set for wider application, in tropical America and beyond," says Dr. Ashby. "With sufficient funds, local municipal governments and communities can set up their own committees and watershed organizations to improve the livelihood of poor people through better land management. This approach can help poor people in tropical hillsides throughout the world, in Africa and Asia, as well as through the rest of Latin America and the Caribbean."

The Consultative Group on International Agriculture is a global agricultural research network that works to promote food security, poverty eradication and the sound management of natural resources in the developing world. (<http://www.cgiar.org>)

Future Harvest builds public understanding of the importance of international agricultural research to global peace, prosperity, environmental renewal, health, and alleviation of human suffering. (<http://www.futureharvest.org>)